

***A more cost-effective
EMAP-Estuaries benthic
macrofaunal sampling
protocol***

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EMAP Benthic Macrofaunal Sampling Protocols

| | East & Gulf Coasts | West Coast |
|------|--|---|
| Then | 0.04 m ² grab 0.5 mm mesh sieve 5 -3 reps per station 30-50 stations | |
| Now* | 0.04 m ² grab 0.5 mm mesh sieve 1 rep per station 30-50 stations | 0.1 m ² grab 1.0 mm mesh sieve 1 rep per station 30-50 stations |

*U.S. EPA 2001. Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Quality Assurance Project Plan 2001-2004. EPA/620/R-01/002.



Statement of Premise

If the EMAP-W sample unit is effective, and

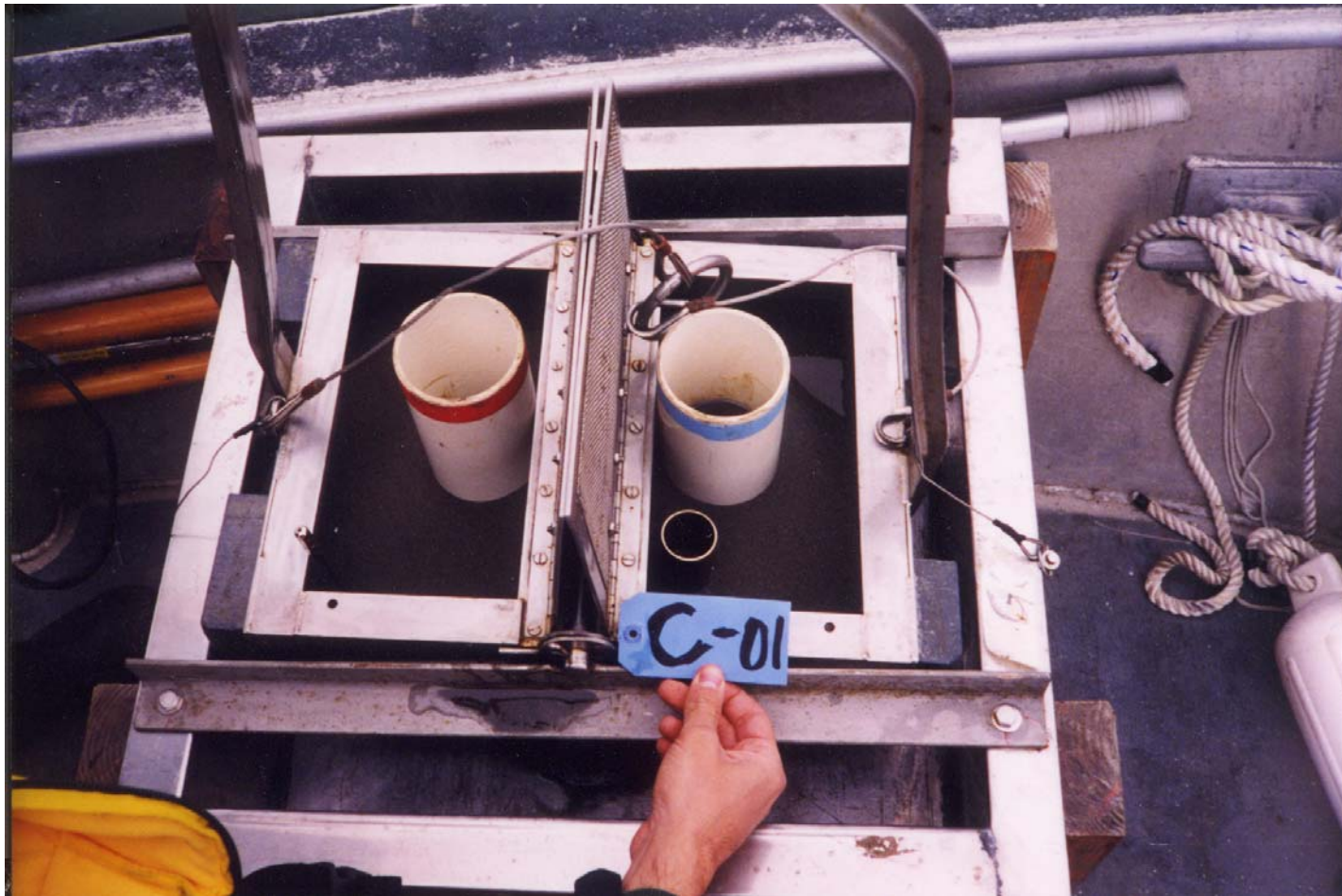
if an alternative sample unit provides data which is only different in scale to that obtained by the EMAP-W sample unit (i.e., equivalent conclusions are reached with both data), and

samples collected using the alternative sample unit are less costly to collect and process than the EMAP-W sample unit, then

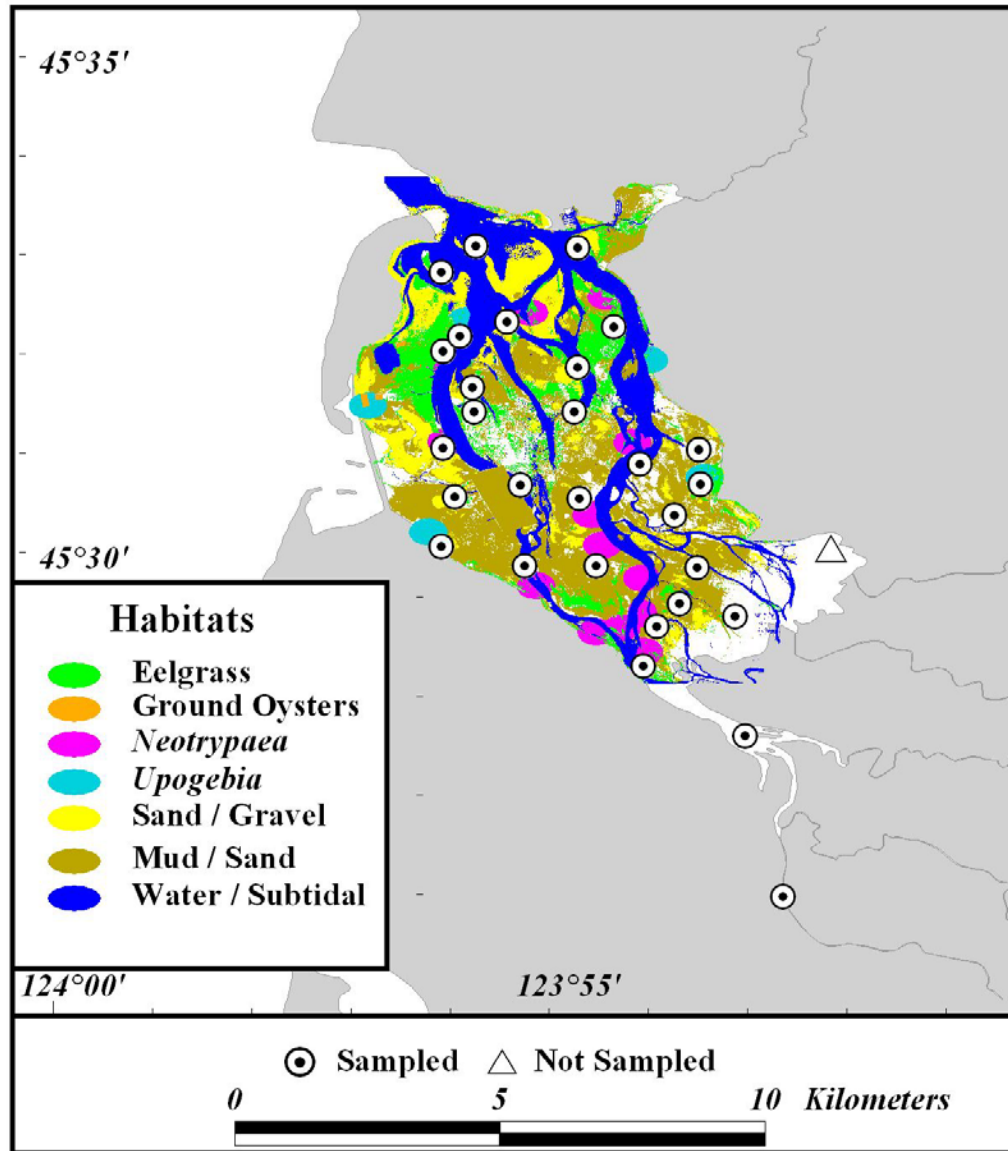
the alternative sample unit is more cost-effective.



**EMAP-W (0.1 m²) benthic macrofaunal sample
versus
0.01 m² x 5 cm deep (two 8-cm dia core) sample**



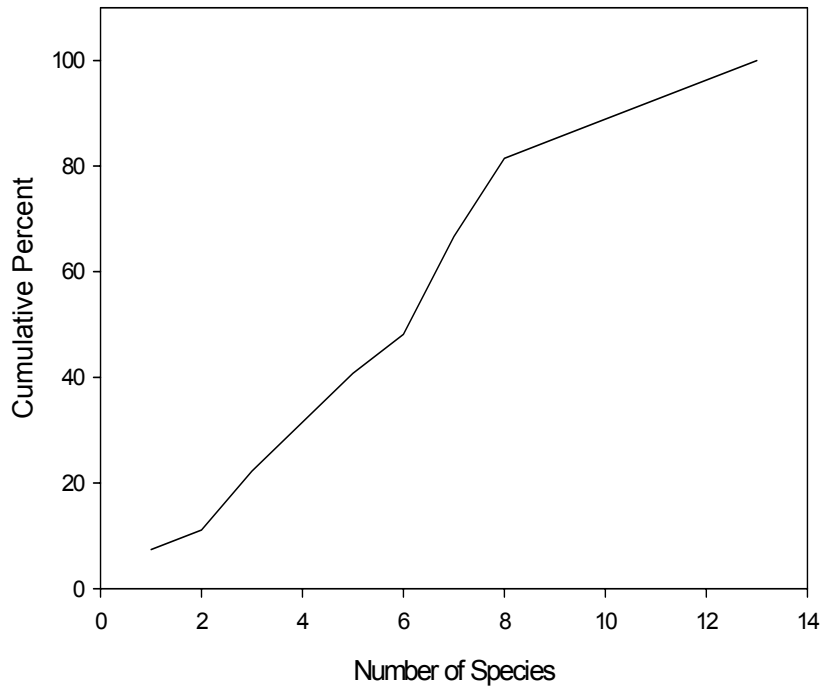
Tillamook Bay, Oregon



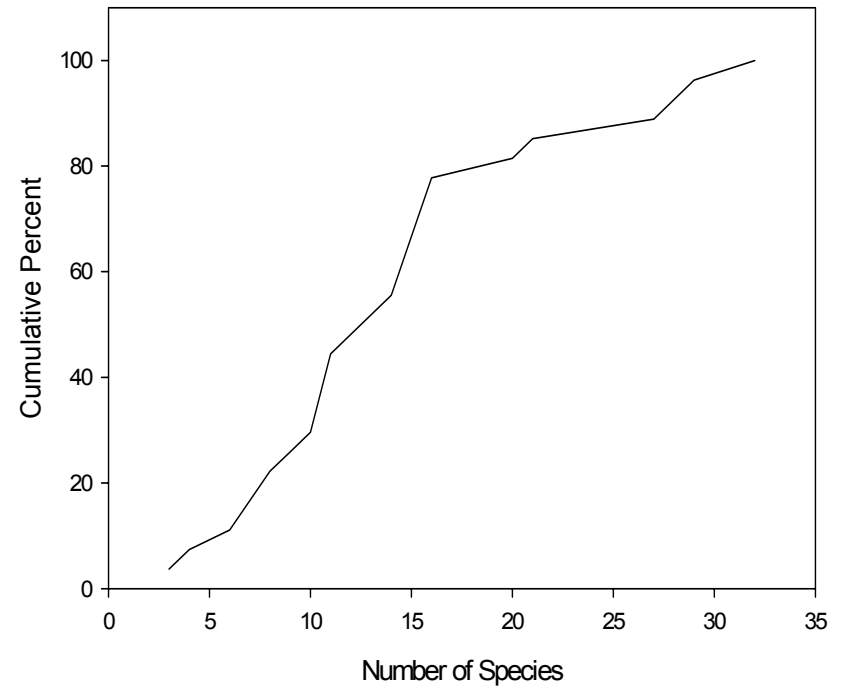
RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

CDFs for Number of Species



0.01 m² x 5 cm deep sample data



EMAP-W (0.1 m²) sample data



Linear Scale Transformation

adjusts for mean shift and scale change in distribution

$$X_t = [Y_{\min} - (X_{\min} * \text{range } Y) / \text{range } X] + (\text{range } Y / \text{range } X) * X$$



EMAP-W ($0.1 \text{ m}^2 \times \geq 7 \text{ cm deep, 1.0 mm}$) data

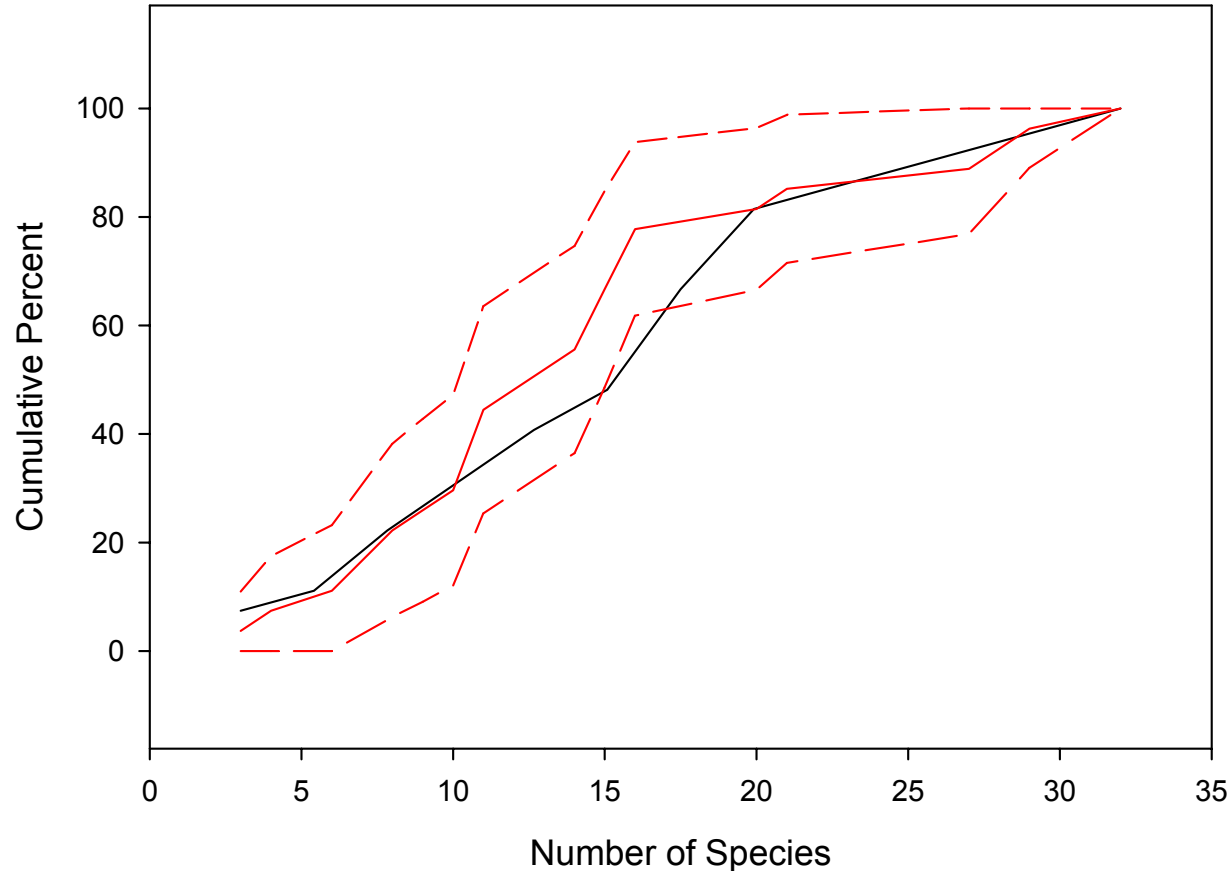
versus

Linear Scale Transformed

$0.01 \text{ m}^2 \times 5 \text{ cm deep, 1.0 mm}$ data



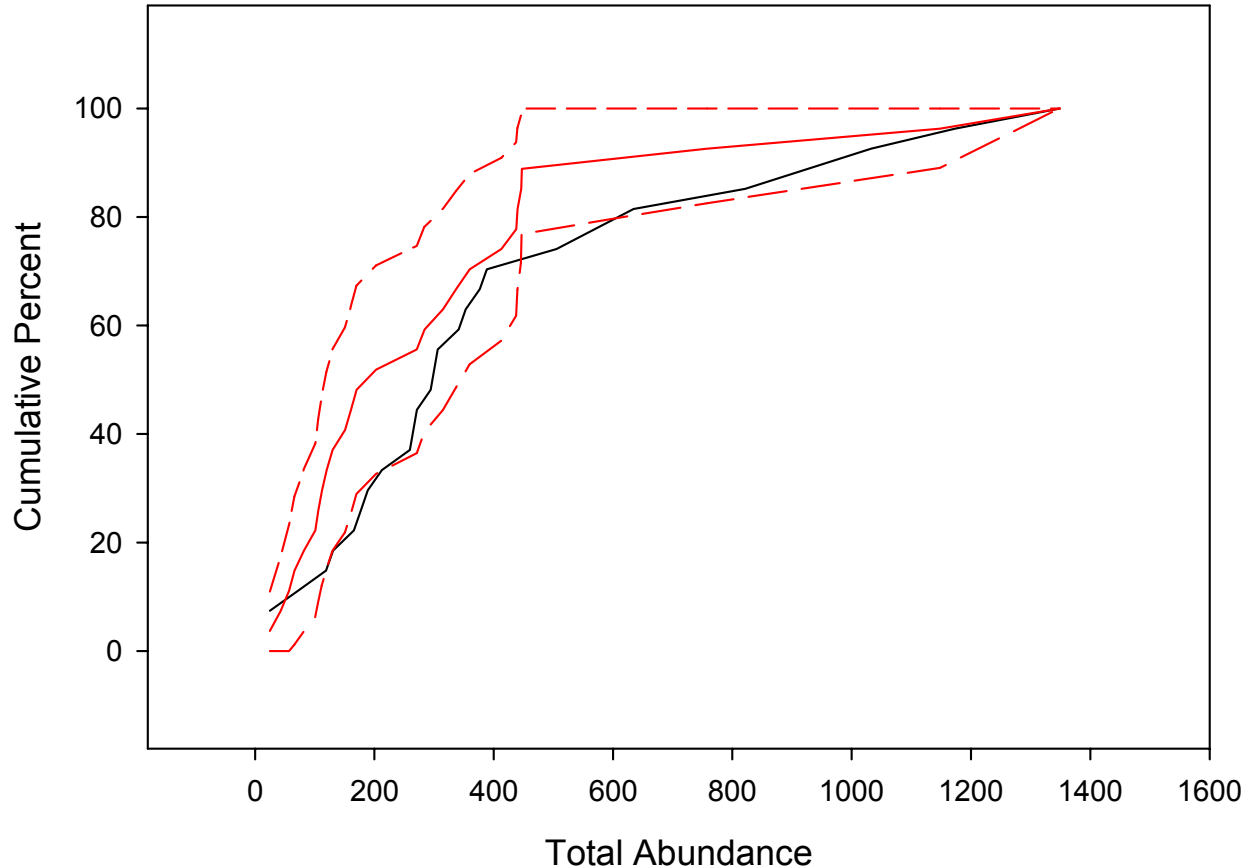
CDF for Number of Species



EMAP-W sample data — , 95% confidence limits - - -
0.01 m² x 5 cm deep sample data, transformed —
F-based Wald test, $p > 0.05$



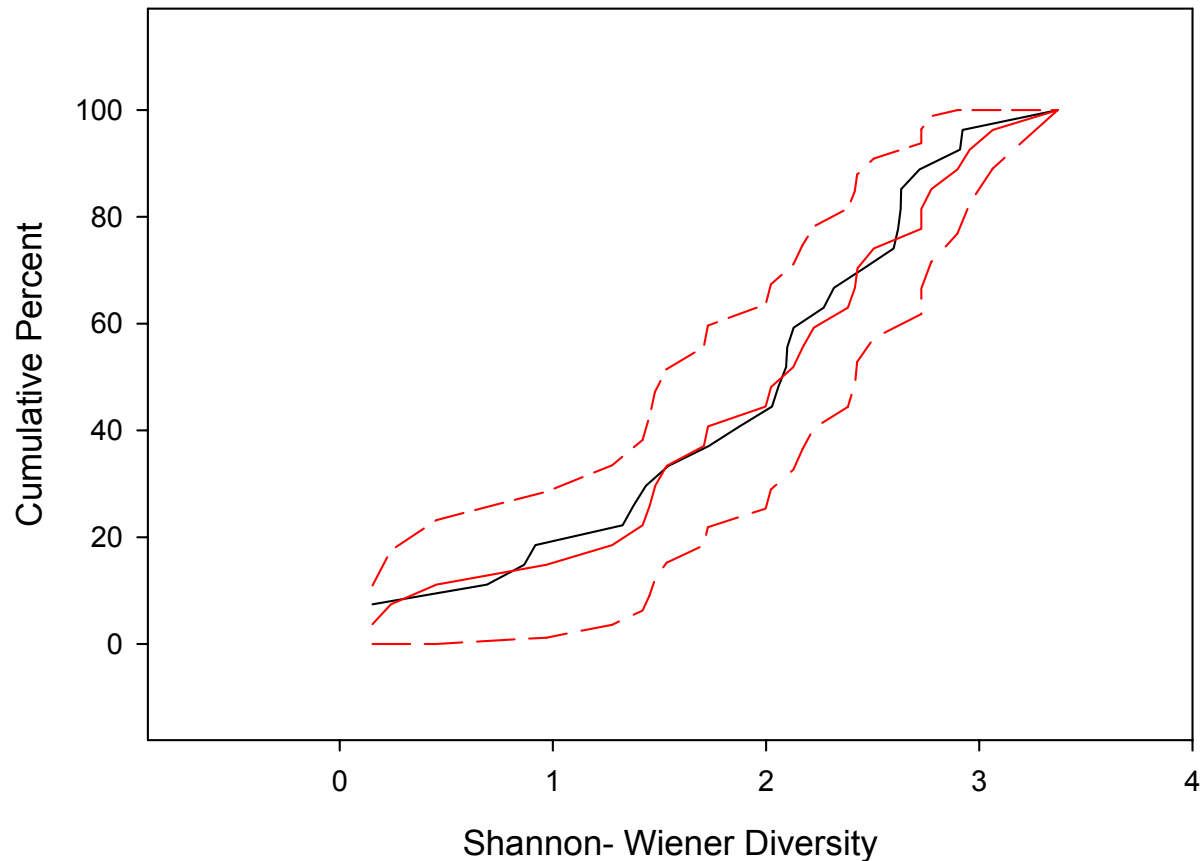
CDF for Total Abundance



EMAP-W sample data — , 95% confidence limits - - -
0.01 m² x 5 cm deep sample data, transformed —
F-based Wald test, $p > 0.05$



CDF for Shannon-Wiener Diversity



EMAP-W sample data — , 95% confidence limits - - -
0.01 m² x 5 cm deep sample data, transformed —
F-based Wald test, $p > 0.05$



0.01 m² x 5 cm deep, 1.0 mm data

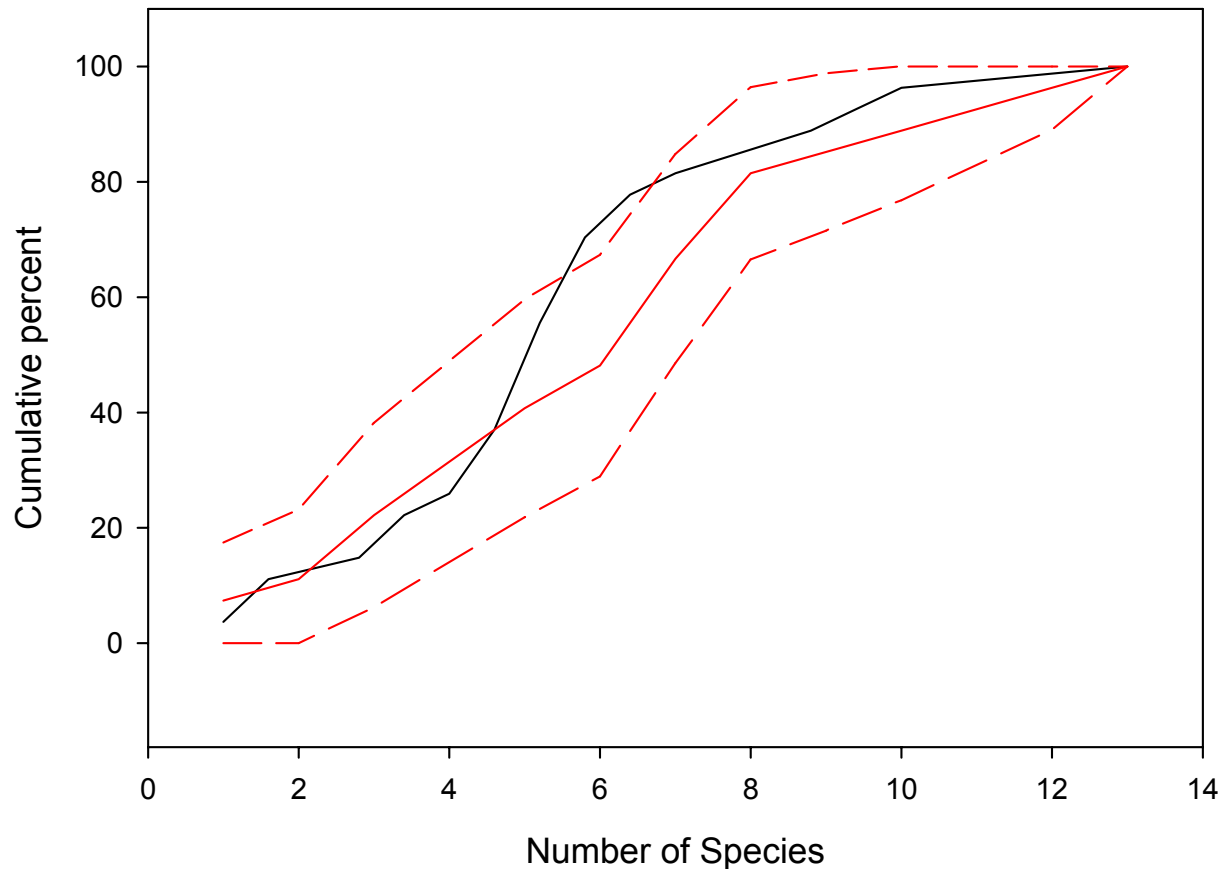
versus

Linear Scale Transformed

0.01 m² x 5 cm deep, 0.5 mm data



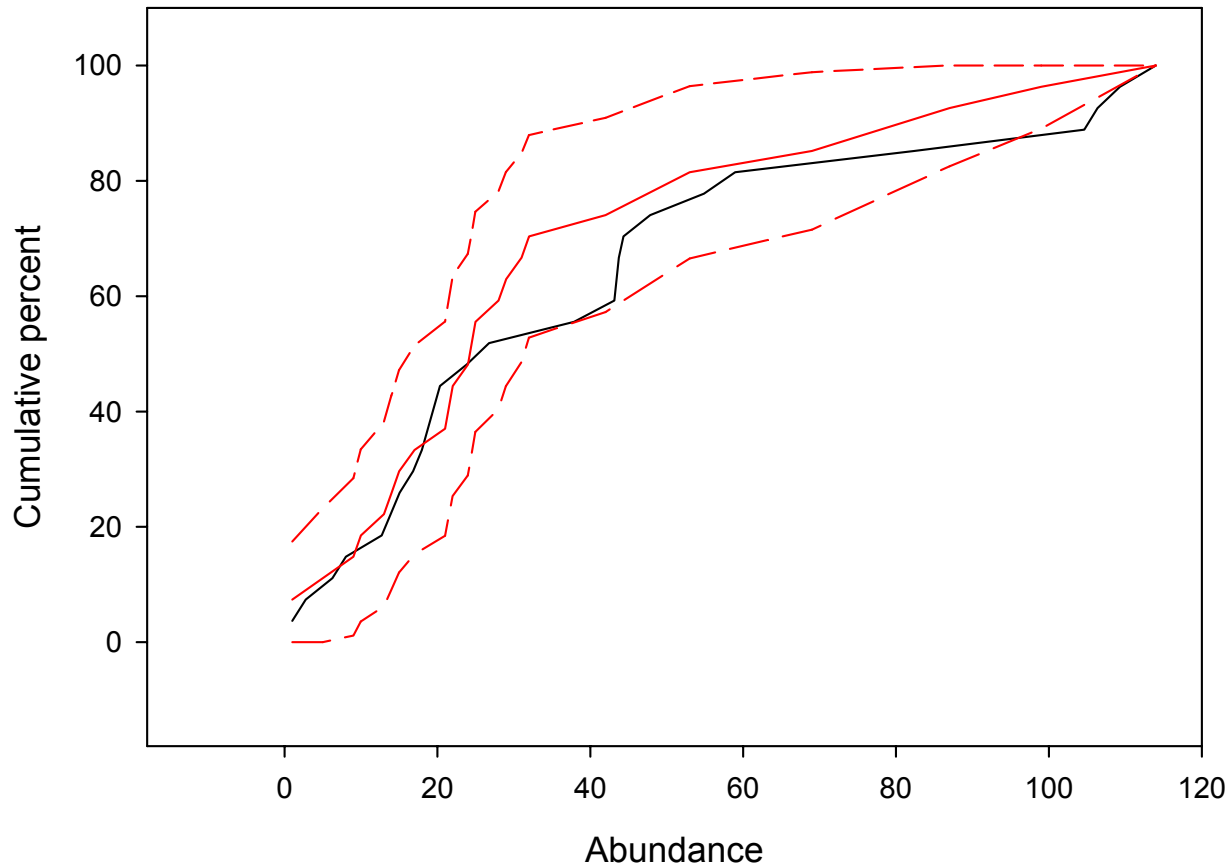
CDF for Number of Species



1.0 mm data — , 95% confidence limits - - -
0.5 mm data, transformed —
F-based Wald test, $p > 0.05$



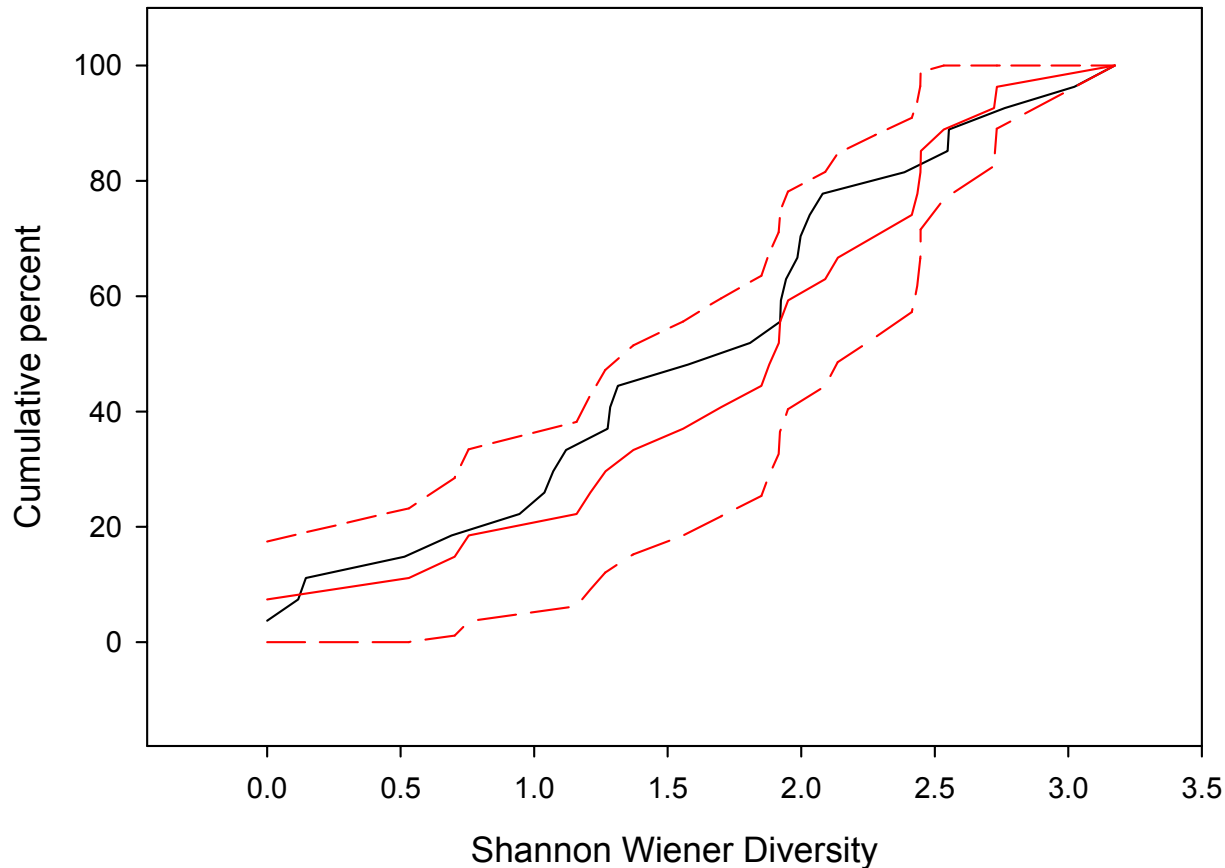
CDF for Total Abundance



1.0 mm data — , 95% confidence limits - - -
0.5 mm data, transformed —
F-based Wald test, $p > 0.05$



CDF for Shannon-Wiener Diversity



1.0 mm data — , 95% confidence limits - - -
0.5 mm data, transformed —
F-based Wald test, $p > 0.05$



“Cost” Savings (excluding overhead)

- **~90% reduction in sample processing (sieve, sort, identify, and count specimens) time and effort.**



\$ Cost Savings (including overhead)

**Lab and field \$ cost comparison for the Tillamook Bay
EMAP-W benthic macrofaunal field study**

EMAP-W samples: \$50,000

0.01 m² x 5 cm deep samples: \$27,500

Cost savings: \$22,500 or 45%.



Some Reasons for Using a Particular Sample Unit

- only or best sample gear available (“It’s what I got.”)
- intuition (“I think it will meet my study’s objective.”)
- historical precedent (“I/We’ve always done it that way.”)
- standardization (“I want to compare or combine my data with other data.”)
- effective (“It meets my study’s objective.”)
- cost-effective (“It meets my study’s objective, and it’s least costly.”)



Recommendation

- **Collect and separately process subsamples (e.g., 0.01 m²) from current EMAP-Estuaries benthic macrofaunal samples (0.04 and 0.1 m²).**
- **Compare CDFs based on subsample data and whole sample data on endpoints of interest after linear scale transformation of the subsample data.**
- **If the CDFs are consistently not significantly different, the test data can be used to calibrate subsample with whole sample data (providing continuity with the historical data), and more cost-effective future studies can be conducted using the smaller sample units.**

